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Full Length Research Article

Technical Efficiency of Onion Production in Kebbi State: A Stochastic Frontier Production Function Approach

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ABSTRACT
This study investigates onion producers' technical efficiency level in Kebbi State. Purposive and simple random sampling procedures were adopted in selecting 210 onion producers using structured questionnaire from seven local government areas in the state. Descriptive statistics, gross margin and stochastic frontier production models were employed in describing and analyzing the data. The results showed that producers generated an average gross revenue and gross margin of ₦1,085,692.51 and ₦700,388.33 at farm-gate price, respectively. The coefficients of farm size (0.6779), labour (0.1700) and seed (0.01011) were significantly positive in influencing the onion output, while level of education and household size significantly increased technical efficiency of producers. The technical efficiency of the pooled sample ranges from 0.13 to 0.95 and the mean technical efficiency was 0.78. Production constraints recorded were; high cost of input, pest and disease attack, poor pricing and inadequate government support. In conclusion, onion is a viable agribusiness enterprise for wealth generation and reliable means of small producers' livelihood and lucrative business for large scale producers. The study recommends the need to identify sustainable interventions through government/nongovernmental support policies to improve input supply system, encourage adult education vide extension service and strengthening linkages among onion producers.
KEYWORDS: Onion production, Technical efficiency, Allocative efficiency,

INTRODUCTION

Onion (*Allium cepa* L.) is a vegetable crop which belongs to the family *Alliacee*. It is a biennial plant but usually grown as annual. Onion production under good management practices can yields up to 5kg per meters-square in 90 days from planting date (Mike and Martin, 2009). It is also one of the most commonly consumed vegetable crops in the world with China being the number one producer, while Japan and India are the second highest producers of green onions and dry onions, respectively (FAO, 2015). Similarly, Nigeria ranks sixth amongst the top ten producers of green onions in the world and eleventh in terms of dry onion (Sence Agric, 2017). According to FAO, (2019) statistics and data research, Nigeria produces 997,900, 1,031,014 and 996,519 million tonnes of dry onion in 2015, 2016, and 2017, respectively. In Nigeria, onion is grown mostly in Kano, Kaduna, Jigawa, Sokoto, Plateau, Bauchi and Kebbi States. Kebbi State is also home to some of the biggest onion markets in Nigeria such as that of Aliero, and Yauri Local
Government Areas.

Onion is an indispensable vegetable which serves as a condiment for almost every household in Nigeria. It can be eaten in its fresh/row form, as ingredient in salads, processed to make onion paste, dehydrated onion flakes, onion oil and onion sauce (Anonymous, 2019; Directorate of Onion and Garlic Research, 2021). Onion is also an ingredient in the industrial process of manufacturing moth repellents and can provides the body with medicinal/health benefits (Ravi, 2016). Economically, onion production support both individual value-chain actors as well as the nation by way of exportation to other African countries (Anonymous, 2014).

However, the level of yield appears to be as low as 15-20 tha^{-1} compared with $45tha^{-1}$ potential yield in India (Denton and Ojeifo, 1990). This low level of onion productivity is despite the present and the past innovation policies and programmes introduced in Nigeria by different government regimes and international donor bodies which aimed at increasing the resource use efficiency in the production of many crops, vegetables inclusive. Daneji (2011) reported that various agricultural development programmes and policies were executed by successive administrations in Nigeria between 1960s and date aimed at improving the level of agricultural production and ensure self-sufficiency in food production. It thus, becomes inevitable to have the knowledge of the efficiency with which onion growers operate as increase in productivity depends on sustainable resource use efficiency at a farm level. Similarly, improving the efficiency at which onion producers operate is very important as a way to increasing productivity, wealth creation, poverty reduction and food security to the onion farming communities in the study area as well as policy formulation for the nation at large.

According to production theory, a farmer is assumed to choose a combination of variable inputs and outputs that maximize profit subject to technology constraint (Sadoulet and Janvry, 1995). Adesina and Djato (1996) asserted that efficiency is the ability of a firm to achieve potential maximum profit, given the level of fixed factors and prices faced by the firm. Economic theory identifies at least three types of efficiency; technical, allocative and economic efficiency (Bamidele *et al*., 2010; Rahman, 2013). Technical and allocative efficiencies are components of economic efficiency (Abdulai and Huffman, 1998) and allocative efficiency deals with the extent to which farmers make efficient decisions by using inputs up to the level at which their marginal contribution to production value is equal to the factor Cost. Technically efficient farm operates on the production frontier while technically inefficient farm operates below the frontier and could be made efficient by increasing its output with the same input level or using fewer inputs to produce the same level of outputs. Thus, the closer a farm gets to the frontier, the more technically efficient it becomes (Rahman, 2013).

An investigation into onion farm efficiency in the study area is still scanty as most of the studies dwell much on profitability of onion production without or little course for efficiency evaluation. Few of such studies gave attention to onion production (Grema and Gashua, 2014; Dauda *et al.,* 2016; Opeyemi and Tohib, 2017) carried out in the study area or other states in the Nigeria. This paper is therefore aimed at determining the current levels of technical efficiency for onion producers in Kebbi State, Nigeria with a view to explain those factors that are responsible for their level of technical efficiency. Specifically, the study focuses on costs and returns analyses, producers' technical efficiency levels and production constraints faced by onion producers in the study area.

MATERIALS AND METHODS

The Study Area

The study was conducted in Kebbi State located in the north-western part of Nigeria. Kebbi State is situated between latitudes 10^0 8'Nand 13^0 15'N and longitudes 3^0 30'E and 6^0 02' E and is bordered by Sokoto and Zamfara States to the east, Niger State to the south, Benin Republic to the west and Niger republic to the north (Kebbi State Government, 2018). Kebbi State occupies an area of about 37, 699 square kilometers out of which 36.46% is made up of farmland (Kebbi State Government, 2018). The State has a projected population of about 4, 440, 050 million, out of which 51% are males, while 49% are females (NPC, 2016). Kebbi State has tropical weather conditions with three seasons: rainy, dry and hot. The annual rainfall is variable and declining, being 600 mm to 850 mm and on average 650 mm. The monthly temperature in the region ranges from 25 ^{0}C to 45 ^{0}C (Usman *et al*., 2016). The state possessed two important agricultural lands namely: dry land (arid-prolonged dryness) and fadama (floodplains-significant alluvial clay particles). These two lands remained the key source of income to millions of people in the state (Usman *et al*., 2016). Agriculture is the most important economic activity, with riverine floodplains producing crops like groundnuts, cotton, rice, millet, sorghum and vegetables such as tomato, onions etc. Majority of the farmers in Aliero, Maiyama, Jega and Birnin Kebbi Local Government Areas in Kebbi State cultivate onion as dry season crop, while Yauri and Shanga Local Government Areas cultivate in both season (Dauda *et al*., 2016). Most of the land in the state is used for grazing livestock. The major ethnic groups in the State include Fulani, Hausa, Dakarkari and Kambari (Amy, 2019).

Sampling Procedure and Sample Size

A multistage sampling procedure was adopted to select the respondents from the study area. In stage I, seven local government areas were purposively selected out of the13 local government areas that are into onion production in the state based on their high relative involvement in onion production. The local governments selected were; Aliero, Augie, Birnin Kebbi, Gwandu, Maiyama, Shanga and Yauri local government areas. Stage II, involves purposive selection of two dominant villages from each of the seven local government areas based on their large number of onion producers in the area which makes a total of 14 villages. In Stage III, for each of the 14 villages, a list of onion farmers was compiled with the help of the Village Head in charge of an area of respective jurisdiction. Simple random sampling method was employed in the selection of 15 respondents in each of the villages giving a sample size of 210 onion producers used for the study.

Data Collection

Primary data and secondary information were used for the study. The primary data was generated via field survey by the use of structured questionnaire prepared in English language while the face to face interview with the respondents in the study area was done in local language (Hausa) with the assistance of trained enumerators. Secondary information includes journals, government reports, text books and unpublished materials.

Methods of Data Analysis

The collected data were analyzed using the following tools of analysis; Descriptive statistics such as frequency counts, percentages, mean, Minimum and Maximum scores. Gross margin analysis was used to estimate the costs and returns in onion production, while stochastic frontier production function was used to estimate technical efficiency of onion production.

Gross Margin Analysis Model Specification

Gross Margin (GM) can be defined as the difference between the Gross Farm Income (GFI) and the Total Variable Cost (TVC). It is a useful planning tool in situations where fixed capital is negligible portion of the farming enterprises in the case of small scale subsistence agriculture (Olukosi and Erhabor, 1998).

GM=TR-TVC________________ (1)

Where;

GM=Gross Margin (₦),

TR=Total Revenue (₦), and

TVC=Total Variable Cost i.e. the cost of variable inputs used (₦),

Stochastic Frontier Production Function Model Specification: Stochastic frontier production function in its implicit form is written as: (Adopted from Arifa and Basanta, 2017)

$Y_i = f(x_i.\beta) + e_i$ ______________ (2)

$e_i = v_i - u_i$ ____________________ (3)

Where;

Y_i=Quantity of onion output of the i^{th} farm
X=Vector of the input used by the i^{th} farm
B = Vector of the parameter to be estimated
e_i= Composite error term ($v_i - u_i$)
v_i=Random error outside farmer's control
u_i=Technical inefficiency effects
$f(x_i, \beta)$=A suitable function of the vector

The empirical stochastic frontier Cobb-Douglas production function is specified as follows:

$\ln Y = \beta_o + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + \beta_7 \ln X_7 + \beta_8 \ln X_8 + \beta_9 \ln X_9 + (V_i - U_i)$ __ (4)

Where:

Ln= the natural logarithm
Y= Output of onion (bags)
β_o= Constant term
β_1-β_9= Regression coefficients to be estimated
X_1= Farm size (ha)
X_2= Labour (man-day)
X_3= Quantity of seeds (kg)
X_4= Quantity of fertilizer (kg)
X_5= Organic manure (kg)
X_6= Agrochemicals (liter)
X_7= Petrol (liter)
X_8= Engine oil (liter)
X_9= Irrigation interval (days)
V_i=Random error outside the farmers control
U_i= Technical inefficiency effects

The determinant of technical inefficiency is defined by:

$U_i = \delta_o + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4$ ____________________ (5)

Where:

U_i= Inefficient effects
δ_o= Constant
$\delta_1 - \delta_4$= Parameters to be estimated
Z_1= Age of farmer (years)
Z_2=Formal education (years of formal schooling)
Z_3=Farmers experience (number of years in onion production)
Z_4=Household size (number of people)

The specification of the model for the inefficiency effects in equation (5) implies that, if the independent variables of the inefficiency model have a negative value on an estimated parameter, then the associated variable has a positive influence on efficiency while a positive sign indicates that the reverse is true (Karthick, 2015).

Thus, the *a priori* expectation is that the coefficients of the whole independent variables of the inefficiency model (i.e. Z_1, Z_2, Z_3, and Z_4) should all be negative (i.e. less than zero). Therefore, each variable is expected to have positive effect on technical efficiency.

RESULTS AND DISCUSSION

Cost and Returns Analysis

Cost and returns component for onion production is presented in Table 1. The table shows per hectare costs of onion production in the study area to be ₦417, 735.52, ₦385, 304.18, and ₦32,431.34per hectare as total cost, total variable cost and total fixed cost respectively. Fixed cost value constituted the least expenditure incurred from rent and depreciation of farm implements. Depreciation was computed by using the straight-line method (i.e. original cost of item less salvage value divided by the expected life of the item). This depreciation of asset portrayed low level of investment on fixed assets as indicated by the lowest percentage (7.76%) of the total cost of production by the onion producers in the study area. The value of fertilizer as one of the most important input in onion production made up 25.64% (₦107, 112.72) followed by cost of seed 13.92% (₦58,154.91) expended per hectare. This could be due to high cost of inputs procured for production. The study further reveals that ₦112,211.48 was expended on labour which constituted 26.86% of the total cost of production, it was estimated based on wage of labour in locality per man day.

The research study clearly showed that labour cost, fertilizer and seed constituted the largest proportion of the total cost of onion production. Thus, the findings indicated that variable cost accounted for 92.23% of the total cost. The mean output of onion per hectare among the producers was 71.58 bags (3, 579kg) with an average price per bag of ₦15,167.54 valued at the farm-gate prices. This result is in agreement with the findings of Ojo *et al*. (2009) and Tsoho and Salau (2012) who studied onion/vegetables production in Sokoto State, Nigeria and found out that variable cost accounted for 83.99% and 92.19% of the production cost respectively. The estimated gross revenue, gross margin and net farm income obtained were ₦1,085,692.5133ha^{-1},₦700, 388.33ha^{-1} and ₦667, 956.99ha^{-1} respectively. The implication of the results is that in general, the cost and return analysis indicates onion production in the study area was lucrative which is in line with the findings of Ojo *et al.* (2009).

Technical Efficiency of Onion Production

The Stochastic frontier model specified was estimated by the Maximum Likelihood Estimates (MLE) method using Frontier (version 4.1c) software for onion producers in the study. The stochastic production estimates and inefficiency determinants are presented in Table 2. The result showed that the generalized log likelihood function was -42.879 which implies inefficiency exists in the set of the data. The variance parameter estimates for sigma-squared (σ^2) and gamma (γ) are 1.4505 and 0.9792 and significant at 10% and 1% respectively. The sigma-squared (σ^2) depicts the goodness of fit and correctness of the distributional form assumed for the composite error term while the gamma (γ) indicates the systematic influences that are unexplained by the production function and the dominant sources of random error (Amodu *et al*., 2011).

Thus, the value of the gamma (γ) implies that 97.9% of the output variation of onion producers from the frontier was due to the producers' technical inefficiencies in their individual onion farms not because of random variability. In other words the inefficiency effects make significant contribution to the technical efficiencies of the onion producers. By implication 2.1% of the variation in output among the onion producers was due to random factors such as unfavourable weather condition, effect of pest and diseases, data measurement errors that are outside the producers' control. The factors that are accountable for the onion producers' technical inefficiencies are within their control and reducing the effects of these factors would greatly upscale their technical efficiency and enhance their productivity. The sigma-squared (σ^2=1.4505) is statistically significant at 10%. Table 2further shows that the estimated coefficients of all the parameters of production function have positive signs as expected, except that of organic manure and petrol. This means that a unit increase in farm size, labour and seed inputs will lead to increase in the gross output of onion.

The estimated coefficient of farm size was 0.6779 which is positive and statistically significant at 1% level of probability. This confirms to the *a priori* expectation that increase in farm size will bring about increase in onion output. This signifies that if one unit area of farm size is increased, while keeping other variables fixed there will be a corresponding increase in mean output by 0.6779 kg. The result is line with the findings of Ojo *et al*. (2009) study of technical efficiency in irrigated onion production in Goronyo, Sokoto State Nigeria and Amodu *et al*. (2011) study of resource use efficiency in part-time food production in Idah, North central, Nigeria. The coefficient of labour (0.1700) was positive and statistically significant at 5% level of probability. This coefficient of labour shows that an increase of one unit of labour while keeping other variable inputs in the model fixed there will be a corresponding increase in mean output by 0.1700 bags. This result is in line with the independent reports of many researches on related work in Nigeria, including the works of Nsikakabasi *et al*. (2011), Shettima *et al*. (2016) and Omotoso *et al*. (2021) who reported positive coefficient of labour and statistically significant at 10%, 1% and 5% respectively. In this study area, the use of traditional farming implements is the commonest practice due to subsistence level of farming, thus, human labour plays an important role in the production of onion.

The production coefficient of onion output with respect to quantity of seed is positive (0.1011) and statistically significant at 5% level of probability.This means that if seed input is increased by one unit while keeping other variable inputs in the model fixed, there will be a corresponding increase in mean output by 0.1011 bags.

This finding agrees with the results of Grema and Gashua (2014) study of economic analysis of onion production in Yobe State, Nigeria who reported that the coefficient of seed was positive and significant at 5% which implies that when more seed is applied the more the output of onion produced.

The table further revealed that the coefficients of inorganic fertilizer, agrochemicals, engine oil and irrigation interval had assumed positive signs but not significant. Meanwhile, the coefficient for organic manure was negative (-0.0092) but significant at 10% statistical level. The negative relationship of manure with the output implies that if there is one unit increase of organic manure while keeping other variables in the model constant there will be a corresponding decrease in the mean output of onion by -0.00929 bags. This is contrary to the findings of Okon *et al*. (2010), Nsikakabasi *et al*. (2011) and Omotoso *et al*. (2021) who found that coefficient of organic manure was positively significant at 1%, 5% and 1% level of probability, respectively. However, the negative value of manure is in agreement with the report of BARI, (2000) as in Earfan and Samad (2013) who attested insignificant contribution of livestock manure and crops residues in semi-arid sub Saharan Africa.

The result of the inefficiency model is also presented in Table 2. The estimated coefficients of the inefficiency function offer some clarifications for the relative efficiency levels among the respective onion producers. A positive sign of an estimated parameter indicates that the attached variable has negative consequence on efficiency and a negative sign implies positive effect on efficiency. The negative coefficients for age, education level, and family size entail negatively related with technical inefficiency, whereas, farming experience was positively related with technical inefficiency. The coefficient of education level and family size were -0.1683 and -0.2633 respectively and significant at 10% level of significance. This depicts that as the level of education and family size of the onion producer increased in the study area, the technical inefficiency of the onion producers decreases. This is also as reported by Shettima *et al*.(2016) and Omotoso *et al*. (2021). The coefficient of farming experience was 0.1136 which is positive and significant at10% level of significance. This means that the more farming experience acquired by the onion producers, the higher will be the farmers' level of technical inefficiency or the lower his level of technical efficiency. This result contradicts *a priori* expectation. This may be attributed to the fact that producers have more time to concentrate efficiently on their long inherited traditional agronomic practices in onion production as they have little or no extension contact or new technologies on which to lay hands for an improved efficiency.

Table 1: Estimated costs and returns analysis for onion production

COST ITEMS AND REVENUE	COST (₦/Ha)	PERCENTAGE
Material Inputs		
Seed (kg)	58,154.91	13.92
Fertilizer (kg)	107,112.72	25.64
Manure (kg)	34,485.23	8.26
Agrochemicals (liters)	19,409.58	4.65
Petrol (liters)	35,307.47	8.45
Engine oil (liters)	13,428.39	3.21
Maintenance	5,194.39	1.24
Total Material Input Cost	273,092.70	65.37
Labour Inputs		
Land Preparation	31,473.18	7.53
Planting	20,864.10	4.99
Replacement	3,556.96	0.85
Fertilizer application	2,571.13	0.62
Manure application	4,463.23	1.07
Spraying	4,724.11	1.13
Weeding	21,654.61	5.18
Harvesting	22,813.75	5.46
Cutting	90.42	0.02
Total Labour Input Cost	112,211.48	26.86
Total Variable Cost (1)	385,304.18	92.23
FixedCost		
Depreciation of machine/equipment	11,691.73	2.80
Rent	20,739.61	4.96
Total Fixed Cost	32,431.34	7.76
Total Cost of Production(2)	417,735.52	100.00
Output (bag)	71.58	
Price per bag	15,167.54	
Revenue**(3)**	1,085,692.51	
Gross margin (3 – 1)	700,388.33	
Net return (income)(3-2)	667,956.99	

Source: Field Survey, 2020

Individual Farm Technical Efficiency Scores

Flowing from the earlier parameters presented and discussed on technical efficiency, the technical efficiency indices of each onion producer were further estimated and presented in Table 3. The table shows technical efficiency ranges from 0.13 to 0.95. The lowest level of efficiency was 13% which is far below the efficient frontier of 100%. This type of production units are said to be technically inefficient. The highest level of efficiency was 95% which is only 5% away from the frontier. Such types of production units can be regarded as technically efficient. This is because it is difficult for a production unit to attain 100% level of efficiency (Konja *et al*., 2019). The mean technical efficiency was 0.78 (78%) which implies that on the average, onion producers in the study area were able to obtain above 70% of onion output from a given combination of production inputs. From the result obtained, although onion producers can be said to be relatively efficient, however, they still have room to increase the efficiency in their onion production activities of about 22% efficiency gap from the optimum 100% level. These findings compare favourably with other several studies on technical efficiency conducted in onion and other areas of agriculture. For instance, (Ojo *et al*., 2009; Earfan and Samad, 2013; and Shettima *et al*., 2016).

Production Constraints

Agricultural production activities are mostly faced with a number of bottlenecks affiliated to production and marketing operations. Onion producers are not of exception and the constraints to onion production are given in Table 4. Five most prioritized production problems reported by the respondents were; expensiveness of input (84.8%), inadequate knowledge about the inputs (50.5%), pest and disease attack (46.2%), poor quality of the inputs (27.6%), while the fifth was a technical problem of inadequate or poor storage facilities (25.7%).

Table 2: Maximum likelihood estimates of the stochastic frontier function and technical inefficiency

VARIABLES	PARAMETER	COEFFICIENTS	STANDARD ERROR	t-STATISTICS
Constant	β_0	-2.9346	0.4208	-6.9726
Farm size	β_1	0.6779	0.0391	10.607***
Labour	β_2	0.1700	0.0639	2.6978**
Seed	β_3	0.1011	0.0368	2.7485**
Inorganic fertilizer	β_4	0.0105	0.0433	0.2427
Organic fertilizer	β_5	-0.0092	0.0590	-1.5747*
Agrochemical	β_6	0.0326	0.0273	1.1921
Petrol	β_7	-0.0288	0.0505	-0.5712
Engine oil	β_8	0.0076	0.0382	0.2012
Irrigation	β_9	0.0795	0.0757	1.0509
Inefficiency functions				
Constant	δ_0	-2.0952	1.9554	-1.0715
Age	δ_1	-0.0350	0.0295	-1.1852
Education level	δ_2	-0.1683	0.0946	-1.7775*
Farming experience	δ_3	0.1136	0.0729	1.5583*
Household size	δ_4	-0.2633	0.1582	-1.6637*
Diagnosis Statistics				
Sigma-square	σ^2	1.4505	0.8756	1.6565*
Gamma	γ	0.9792	0.0132	73.919***
Log likelihood		-42.879		
LR test		35.572		

Source: FieldSurvey, 2020;*, **, ***=Significant at 10%, 5% and 1% levels respectively.

Table 3: Distribution of technical efficiency indices among onion producers in the study area

EFFICIENCY CLASS INDEX	FREQUENCY	PERCENTAGE
≤ 0.39	4	2.0
0.40-0.49	11	5.2
0.50-0.59	13	6.2
0.60-0.69	18	8.6
0.70-0.79	36	17.1
0.80-0.89	89	42.4
0.90-0.99	39	18.6
Total	**210**	**100.0**
Mean Efficiency	0.78	
Maximum Efficiency	0.95	
Minimum Efficiency	0.13	

Source: Computed from MLE result, 2020

These findings imply the need for identified sustainable intervention by government support policies to easy access to inputs and extension services to offset the cumulative effect of these production problems. All of the onion producers interviewed exhibited lack of contact or existence of the extension agents and credit facilities as institutional means to aids production in the study area. Somehow, these problems are similar in other studies in Yobe, Sokoto and Kebbi States of Nigeria by Grema and Gashua (2014), Dauda *et al*. (2016), Opeyemi and Tohib (2017).

However, the low ranking (18.1%) of inadequate credit facilities and lack of extension services may be attributed to long neglect of the onion producer by the government to the extent that the importance of these factors might have not been felt or experienced by the onion farmers. As points out by Obiechina (2012), poor performances of smallholder farmers in Nigeria is attributed to lack of commitment by all tiers of government to implement the right policies. The discovery of petroleum in Nigeria, government has become neglectful of the agricultural sector because petroleum is considered more viable resources for economic development (Matemilola and Elegbede, 2017). And it could be viewed as due to the weak nature of the farmers in terms of inadequate acquisition of western education and viable cooperative ties which may assist them towards confronting the government to alleviate their common concerns on farm operations.

Table 4: Producers' constraints to onion production in Kebbi State

CONSTRAINTS	FREQUENCY (*n=210)	*PERCENTAGE	RANK
Production constraints			
Expensive/high cost of inputs	178	84.80	1
Inadequate knowledge of inputs	106	50.50	2
Pest and diseases attack	97	46.20	3
Poor quality of inputs	58	27.60	4
Inadequate storage facilities	54	25.70	5
Shortage of land	50	23.80	6
Non-availability of labour	46	21.90	7
Shortage of input (i.e. fertilizer, seed)	46	21.90	7
Inadequate water supply	45	21.40	8
Inadequate credit facilities	38	18.10	9
Lack of extension services	38	18.10	9

Source: Field Survey, 2020***Multiple responses were considered

Conclusion

The study reveals that business of onion production among respondents was generally profitable and buttressed the fact that the cost and return analysis indicates onion production in the study area was lucrative. Thus, investment in onion production is a viable enterprise with prospect in wealth generation, poverty reduction, job security, reduced rural-urban migration. The onion producers' technical efficiency was below the absolute efficiency value in their use of existing variable inputs. Therefore, output of onion can be further enhanced by leveraging on the availability of technologies such as treated seeds, proper usage of agrochemicals and government policies to address inefficiency factors.

Recommendation

Flowing from the research findings the following recommendations are offered for consideration for implementation by the relevant authorities: Farmers' field and basic schools should be organized for onion producers by the relevant authorities to enhance their skills and to close the inefficiency gap in production. The study also recommends sustainable sensitization and increased campaign on optimum level of resource efficiency for better and increased onion production in order to enhance contribution of the commodity to economic empowerment.

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